EMS Annual Meeting Abstracts
Vol. 10, EMS2013-683-2, 2013
13th EMS / 11th ECAM

Future Climatic and agroclimatic conditions in Europe based on a stochastic weather generator and climate change scenarios of different levels of complexity

M. Dubrovsky (1,3) and M. Trnka (2,3)

(1) Institute of Atmospheric Physics, Prague, Czech Republic (dub@ufa.cas.cz), (3) CzechGlobe - Center for Global Climate Change Impacts Studies, Brno, Czech Republic, (2) Institute for Agrosystems and Bioclimatology, Mendel University, Brno, Czech Republic

Future climate projections are loaded by multiple uncertainties, which should be considered while creating weather series for climate change (CC) impact studies. A possible approach to account for the uncertainties coming from various sources is based on a stochastic weather generator (WG), whose parameters are derived from observed weather station data and modified according to CC scenarios determined by a pattern scaling method. The pattern scaling method allows accounting for uncertainties related to emission scenario, climate sensitivity and inter-model (GCMs and/or RCMs) variability. The use of WG allows us to consider the natural climate and weather variability. On a platform of this methodology, the present contribution will examine an additional source of uncertainty, which relates to a complexity of a climate change scenario used to modify the WG parameters: While the CC scenarios commonly include changes in the means of surface weather characteristics required for a given CC impact study (typically precipitation and daily extreme temperatures, possibly solar radiation, wind and air humidity), the changes in other characteristics of the statistical structure of weather series are less frequently involved. These “additional” characteristics may include changes in daily, monthly and interdiurnal variabilities in weather series This contribution addresses an effect of including/non including such characteristics into CC scenarios used in a CC impact study.

The first part of the contribution will present a methodology, which is based on linking a stochastic weather generator M&Rfi with "WG-friendly" CC scenarios. The WG-friendly scenarios are defined in terms of changes in WG parameters and include - apart from changes in the means - changes in WG parameters representing the additional characteristics of the weather series (e.g. probability of wet day occurrence and lag-1 autocorrelation of daily mean temperature). The maps of Europe showing the spatial patterns and inter-GCM variability of WG-friendly CC scenarios will be shown. GCMs from a CMIP3 dataset are used to derive the scenarios.

The second part will present results of CC impact study based on an above methodology applied to a set of European stations taken from an EC&D database. The changes in selected climatic (focusing on the extreme precipitation and temperature characteristics) and agroclimatic (including number of days during vegetation season with heat and drought stresses) characteristics will be analysed. The stress will be put on (a) examining the effect of including the additional characteristics (representing above mentioned variabilities in weather series) into a WG-friendly CC scenario, and (b) comparing this effect with other sources of uncertainty involved in CC scenario.

Acknowledgements: The study is supported by Ministry of Education, Youth and Sports (project LD12029), InterDrought (project OP VK CZ.1.07/2.3.00/20.0248) and NAZV (project QI91C054).